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Procedia - Social and Behavioral Sciences 175 (2015) 137 – 145

Procedia
Social and Behavioral Sciences

International Conference on Strategic Innovative Marketing, IC-SIM 2014, September 1-4, 2014,
Madrid, Spain

Diagnosis of innovation enterprises - study theoretical and empirical results

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Abstract

The aim of this article is to present the model of innovation system in company, as well as the formulation of the concept of evaluation of the innovation capacity of enterprises. In this model will be presented the concept to analyze the relationship between the determinants of innovation organization and the level of innovation taking into account the variables mediating and regulating the established relationships. Determinants of innovation potential and ability determinants of innovation will be characterized such as competence of staff, modern infrastructure, cooperation in knowledge management, organization of work and the protection of knowledge (innovation) created within the organization. Using this concept of innovation the surveyed have been made in enterprises. The empirical part of the article will contain the results of the assessment of the degree of innovation of enterprises Malopolska Region. It was found that above all the knowledge and skills of employees of companies and cooperation between the actors of the industry is a highly innovative company. Emphasized at the impact of contextual variables in relation to innovation organizations drew attention to the size of the market, the nature of the organization, or the type of innovation.

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Peer-review under responsibility of I-DAS- Institute for the Dissemination of Arts and Science.

Keywords: innovation system; innovation potential; innovation capacity

1. Introduction

The study of innovation is a special and so far poorly recognized area of economic analysis company. It is an area of research procedure, the purpose of which is to assess progress in all key areas of activity or some innovative companies and programming changes and the development of the activity, according to the strategy and business model of the company.

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The article presents the concept of the innovation system company whose essential elements are innovative potential and innovative capacity. Describes a method for measuring the qualitative innovation capacity of enterprises, together with the verification procedure of this ability.

How to identify the key determinants of innovation capacity of enterprises, as well as the determinants of the development of this ability is a key trend analysis.

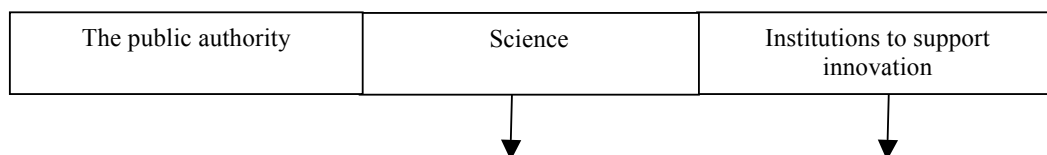
The article assumes that innovation is any, by definition positive change in different areas of the organization, requesting progress in relation to the status quo, positively assessed according to the criteria of the organization. It is also assumed that the examination system of innovation organizations require extension of the field of analysis of issues at the same time innovative potential and innovative capacity issues. In previous studies, attention was paid mainly on the results of innovative activities identifying the number and types of innovations.

The innovative potential of enterprises defined as a set of resources, socio-economic, shaped in the development of the company, constituting the basis for its innovative activities, they create the possibility of projection innovation. In particular, these are material resources, processes, structure, knowledge and other intangible factors inherent in the enterprise and the strategy of innovation. Those of them that are regularly used effectively for the creation of commercial innovations are the ability to innovate enterprise. This ability is so variable mediating the innovation process in the enterprise, and despite its dynamism and the creative nature she is also a variable moderating the process of invention and diffusion of innovation. Moderation occurs when the effect of the independent variable (X) on the dependent variable (Y) varies, depending on the level of a third variable (Z) called the adjusting variable (variable moderating, moderator). Moderating variable specifies the conditions under which the consideration is the independent variable (X) on the dependent variable (Y), thus defines the direction and strength of the relationship between innovation organization and its determinants. In contrast, mediation emphasizes that the impact of the independent variable (X) on the dependent variable (Y) is passed through a third variable (M) called the mediating variable (mediating variable, mediator). Mediating variables relate to causal mechanisms. From the viewpoint of the independent variable - the mediator is an effect, from the point of view of the dependent variable - is the cause of (Baron & Kenny, 1986; Pichlak, 2012).

The innovative potential is also determined by the environment sector, mainly the market, so the company with customers, competitors, suppliers and cooperators (including in particular the relationships that connect the company with its key stakeholders), especially since innovations appear, are found at the interface with the market.

Innovation is thus a function of the company's innovative potential and its innovative activities determined to the innovative capacity (see Figure 1). In contrast, the innovation system is structured and positioning of actors, such as businesses and other organizations that participate in the generation, diffusion and application of new (foreground) useful and bringing economic benefits in the manufacturing process (Hall & Williams, 2008).

At the end of a short presentation to innovation organizations may be noted that innovations are increasingly seen as the result of an interactive process of knowledge creation and diffusion of its application. It is above all the knowledge accumulated by the company in the course of organizational learning, knowledge of deliberate creation, allowing for the effective use of innovative potential (resources) for its innovation, knowledge covered in patterns and economic pragmatism which is the major causative agent of progress and positive changes, is the innovative capacity of the company. One of the few methods for managing knowledge and information, efficient and effective at the same time is Governance e-Learning. There is much said and written about the methods of information and knowledge management, however, can be determined only as untested methodology, concepts of organizing processes involving information and knowledge. Briefly it can be described as learning through the Internet (Learning via the Internet). It goes beyond the framework of the company, can be used to develop a variety of hitherto unknown forms of cooperation, with emphasis especially on the innovation of enterprises. In view of the above principle can be formulated as logical consequences of the processes of organizational learning using e-learning methods in terms of achieving a high state of organizational capacity and high innovation. Organizational learning is a process involving information and knowledge, leading to changes in knowledge and may lead to changes in people's behavior, it may also create innovative capacity of the organization, bringing it to a state of high innovation. Implementation of e-learning in the process of organizational learning in terms of growth stimulates innovation, even creates innovation (Koziol & Wojtowicz, 2014; Koziol et al., 2004).



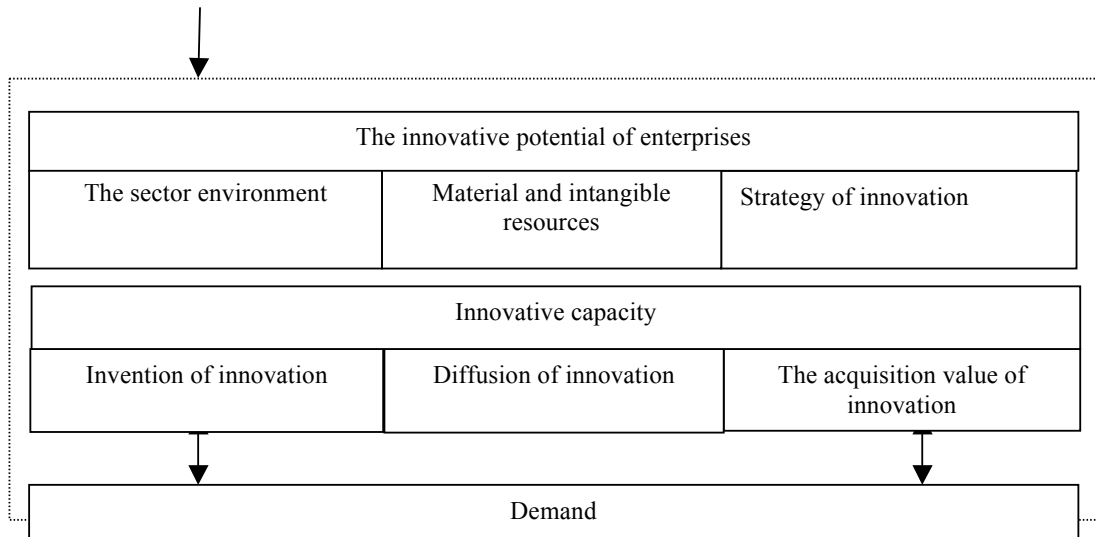


Fig. 1. The system of innovative company. Source: Own research

The aim of of this article is to present the concept of the analysis focused on the identification and assessment of the key determinants of innovation capacity of enterprises. The starting point for the estimation of the innovative potential of the surveyed companies, while the reference is a system of innovative enterprises.

The basic problem that is described in this paper is the recognition of dimensions (areas) innovation potential and assess their effectiveness as a condition for the development of innovation and to formulate model innovation capacity of enterprises. Outlined in this goal of research required to develop the concept of diagnostic analysis aimed at evaluating the ability of innovative companies. An important research tool is the method of conditional inference and analysis of the relationship between resources and the capacity, which shows a causal relationship between these categories.

In the present concept, the following thesis have been taken:

1. The ability of innovative and at the same time is a function of system evaluation criterion of innovation enterprises, as well as the possibility of expanding the projection innovative activity.
2. Innovative capacity can be seen in the forms of partial (which correspond to the determinants of this ability) and can be included in a comprehensive formula for the company or the industry.
3. It was assumed that among the many variables moderating and (regulating) the process of innovation, plays a special role of e-learning understood as a method of improving organizations involving information and knowledge.

The research procedure has following steps:

1. Identification of the subject and scope of the analysis.
2. Identification of dimensions (areas) innovation potential.
3. Measuring the quality level of innovative capacity.
4. Categorization of companies.
5. Verification.
6. Prediction of innovation

2. Diagnosis of enterprise innovation - the results of empirical research

2.1. Identification of the subject and scope of the analysis.

The survey covered 316 companies southern Polish. It was conducted by questionnaire. The majority, ie 80% belongs to the SME sector, others are large companies with over 500 employees. The range of business included the regional market - 40%, national - 33% and the international market - 29%. Half of the services, the rest is engaged in

the production and trade. Almost half of them assess their financial situation as good. Innovative capacity was analyzed in the form of partial and aggregate. Aggregate innovative capacity is a synthetic measure of the maturity of the innovative potential of the enterprise (the system), which integrates in a single formula the innovative capacity of the partial figures given in Figure 3 Potential innovative in its scope can also be considered as a partial or full. The range corresponds to different distinct sub-areas, types, such as employee competence, organization of work, modern IT, cooperation, knowledge management, and innovation types, etc.

2.2. Identification of dimensions (areas) innovation potential.

The issue of the development of innovation enterprise (the system) is seen in two distinctive dimensions: innovation potential and innovative capacity consisting mainly of invention and diffusion of innovation. Correlates of both dimensions are spheres of change and development, ie, areas that contain specific references to the form of innovation. Table 1 shows the areas of innovative potential of enterprises. Given a set of isolated areas of innovation potential among many variables environment and resources of an organization, by analyzing the factors of influence. Indicated those of them whose relevant causal relationships of innovation has been and will be in the future. In the process of identifying them benefited from several different sources. Those that relate to the environment include statistics, special reports, test results and expert opinions predecessors. With regard to the resources of an organization used the opinions of managers and specialists surveyed enterprises. Accept comments and statements form the basis for selection of areas of innovation potential of the company.

Table 1 Dimension innovative potential of enterprises

Areas	The components
Managerial skills and worker	Level of education, investment in training, time and type of training, knowledge of foreign languages, the ability to use the new IT technologies. The use of modern training techniques.
Modern IT technologies	Databases, type and arrangement of the computer system, the utilization of infrastructure, modes of communication within the company.
Organizational structures and processes	Types of employment contracts, collaborative problem solving, innovation culture, infrastructure to support decision-making process for rewarding innovation, forms of work organization, internal relationships between work stations, the existence of the R & D department
External Co-operation on innovation (knowledge alliances)	Cooperation with other entities, partnerships, sources of knowledge, the number of suppliers. Acquisition of knowledge from competitors.
Knowledge management	Access to innovation, legal forms used in security, outsourcing, database types. The company has a knowledge management system.

In turn the determinants of innovation capacity of enterprises are those of the innovation potential areas that are effectively and efficiently used to create innovation. In this sphere, the characteristic classes are innovations, which detailed figures are: the number and types of innovation, such as product innovation, process, organizational and marketing, the results achieved in the short and long term, and others. These detailed characters of change and innovation development companies are also criteria for the evaluation of the spheres.

2.3. Measuring the quality level of innovative capacity.

Measuring the quality level of innovative capacity requires an assessment to verify. Rating checking has

indicated the extent to which the company is achieving its objectives (functions) and meets certain requirements. The general formula for the evaluation examines the relationship is expressed by the facts of the company (S) pattern (M) - the state standard. As defined evaluation checking is also a tool standardization of evaluation criteria by which it is possible to assess aggregate. The evaluation process uses the innovative capacity of the normalization of the type of aggregation point. Assumed the scoring pattern for each subcriterion assessment (component) to 1 (positive scale) and) (negative scale). If the score - 30% of the ingredients of the area is positive (positive scale, ie, 1), then the classification of the area of innovation potential is positive.

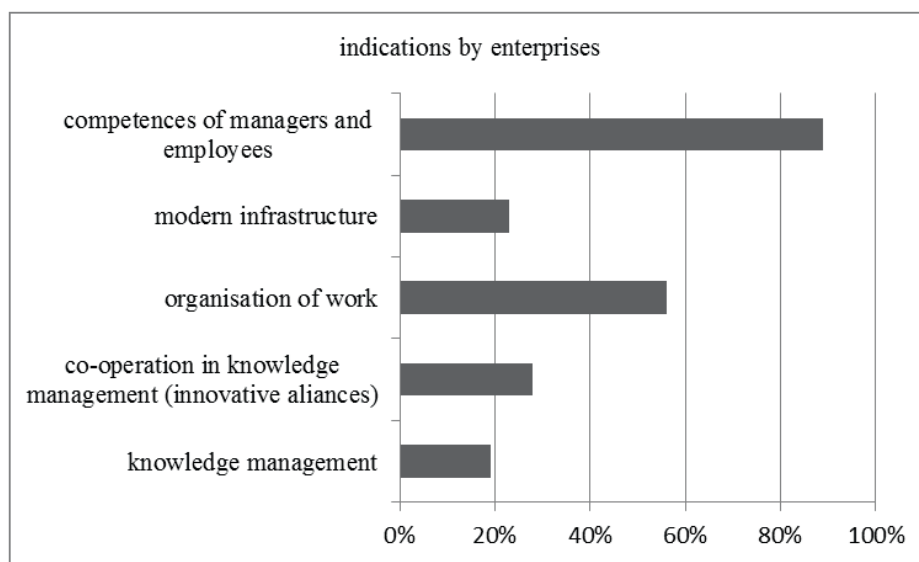


Fig. 2. Determinants of the innovation capacity of enterprises Malopolska Region. Source: Own research.

The analysis of the collected data shows that the 281 surveyed companies employ suitably qualified personnel who have special competence in the field of innovation (Figure 2). As a second important determinant of innovation surveyed companies, a total of 176, indicated the organization of work. The fact that cooperation in knowledge management is vital found 90 companies, while the modern infrastructure and taking action in the field of knowledge indicated respectively 74 and 60 companies. Further analyzes have established that an important differentiating factor configuration of individual determinants of innovative potential, among others. industry in which the firm operates, the use of e-learning methods.

2.4. Categorization of companies.

Categorization is a research procedure, which aims to establish a level of quality aggregate innovation capacity of enterprises. Categorization of enterprises was carried out taking into account their level of innovative capacity. Distinguished company with a low, medium and high level of innovative capacity. Assumed that the low level of innovative capacity are entities that meet one determinant of innovative capacity, the average level of ability is the use of 2-3 determinants by the company, the high level of innovative capacity - serving 4-5 determinants. In assessing whether the determinant is satisfied used conditional inference.

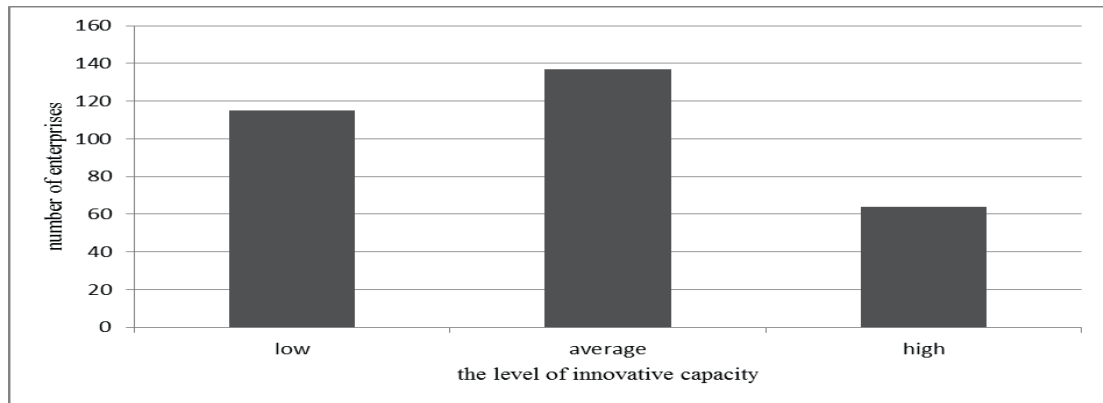


Fig. 3. Categorization of enterprises by innovative capacity. Source: Own research

Low level of innovative capacity is characterized by 115 companies, and the average - 137, high 64 entities. In the process of evaluation of the innovation capacity of enterprises has been established that each company is able to create and innovate, even if does not meet criterion (determinants) that capacity.

2.5. Verification

Verification involves comparing the quality level of the innovation capacity of enterprises (category) with a number of innovations and their generic structure. Tends to confirm the thesis that innovation creates innovative capacity, it is a manifestation of innovation activities (innovation, innovation).

Table 2. Number of innovations according to the level of innovative capacity

Type of introduced innovation	The level of innovative capacity						Total number of innovation
	low		medium		high		
	Number of innovations		Number of innovations		Number of innovations		
	Total	1 operator	Total	1 operator	Total	1 operator	
Products innovation	2	0,02	15	0,1	23	0,4	40
Process innovation	28	0,2	38	0,3	39	0,6	105
Organizational innovations	73	0,6	79	0,6	56	0,9	208
Marketing innovations	34	0,3	87	0,6	57	0,9	178

From the data in Table 2 shows that most businesses have an organizational innovation (208), followed by marketing - and process 178 - 105 minimum product only 40th highest efficiency in terms of innovation, in terms of innovation on the number of deployed one company showed up companies with a high level of innovative capacity. Companies with a medium level of innovative capacity, have a relatively greater number of innovations than companies with low innovation capacity. Moreover, they had created innovative products, the most valuable.

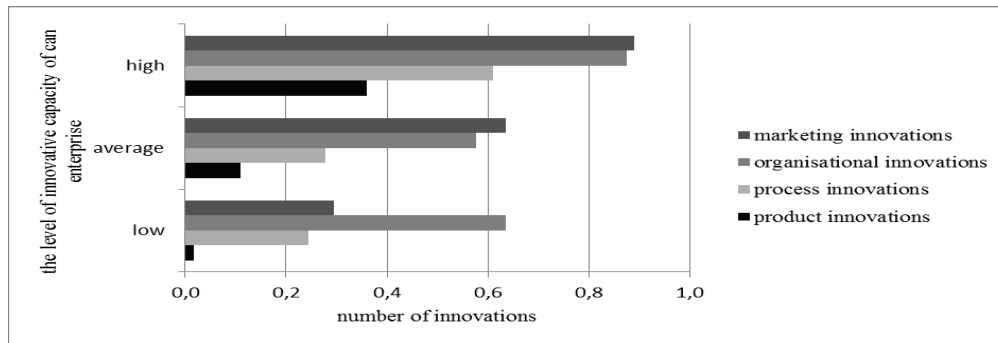


Fig. 4. Number of innovations per one company according to the level of innovative capacity. Source: Own research.

As shown in Figure 4 best utilize its potential companies with high innovative capacity. For each of them fall almost 3 innovation. Enterprises with an average capacity of approximately 1.5 introduced innovations, and companies with low levels of innovation implemented, on average only one innovation. Also was investigated innovative companies that meet all (5) criteria. In this class of enterprises, number 24, was the highest innovation rate and 3.2 innovations was in the company. The results indicate that firms have diversified innovative capacity and, importantly, most of it is used effectively in the creation and diffusion of innovation.

2.6. Prediction of innovation

A significant innovation potential of the surveyed companies is used to a small extent, especially in the area of knowledge management, technology IT and external co-operation in the field of knowledge. An evaluation of the intensification of use of these determinants comparing companies using e-learning method with those who did not use this methodology (see Figure 5). The point of reference, the benchmark enterprises were using a method that e-learning.

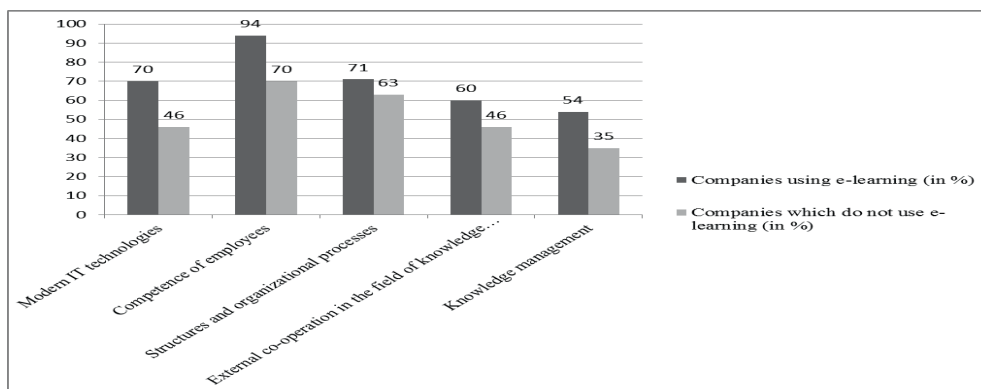


Fig. 5. Determinants of innovation capacity of enterprises using e-learning and acting in a conventional. Source: Own research

The analysis of data shows that e-learning significantly impact on the growth of the innovation capacity of the surveyed enterprises, particularly in the area of knowledge management and modern IT technology and competence of employees. It can therefore accept the thesis that it was mentioned determinants of innovative capacity will account for the development of innovation in the future under the conditions of use of appropriate methods of information management, e-learning methods in particular.

3. Final remarks and conclusions

Diagnosing the innovation capacity of enterprises is an area of the examination procedure, the purpose of which is to assess progress in all or selected areas of enterprise and innovation activity programming changes and the development of this activity, closely associated with the business model and strategy of the company. The article presents the concept of the innovation system company whose essential elements are innovative potential and innovative capacity. It describes the evaluation of the level of research conduct innovative capacity of companies in the form of partial and aggregate. Research has shown that there is a relationship between the potential for innovation and innovative capacity, but this is not directly proportional relationship. There is also a correlation between the innovative capacity to innovation activities (innovation), but also in this case it is not a dependency of a similar nature. It was found that companies with a relatively low level of innovative capacity can and innovation. The principal determinants of innovative capacity at the moment are:

1. Competence management and employees, especially knowledge from the experience and knowledge gained from the outside.
2. The organization of work, and in particular its characteristics, such as: teamwork, culture of innovation, rewarding the innovation, or the operation of the R & D department
3. Much less importance is the cooperation in the field of knowledge, ie knowledge building alliances with customers and other stakeholders, besides the use of open sources of knowledge, or the purchase of technology.

A significant innovation potential of the surveyed companies is used to a small extent, especially in the area of organization, IT and knowledge management (Sakas et al., 2014). It is the intensification of the use of these determinants will constitute the development of innovation in the future under the application of e-learning methods or other suitable methods of management. In view the results of research given its own empirical research results as well as its predecessors, you can formulate a thesis that companies compete to create innovations, as well as innovative capacity. It is the development of this capacity rises to the rank of the primary determinants of survival and growth. Therefore, the evaluation of the innovation capacity can be useful in determining the competitive position and strategic enterprises of the sector.

The implementation of new technologies and social media in companies' innovative activities (Vlachvei and Notta, 2014; Chatzithomas et al., 2014; Stavrianea and Kavoura, 2014; Yasa Özeltürkay and Mucan, 2014; Kiráľová, and Malachovský, 2014; Kavoura and Stavrianea, 2014; Amaral, Tiago and Tiago, 2014) may benefit the efficiency of a firm or an organization; the creation of networks and synergies may also enhance companies' communication and efficiency in order to initiate innovative procedures (Kavoura, 2014). Implementing new software systems or applications in organizations can be a difficult task; nonetheless, efforts are worthwhile for (Stalidis and Karapistolis, 2014; Greve, 2014; Schmidt and Baumgarth, 2014).

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